National Aeronautics and Space Administration

Aeronautics Research Mission Directorate Update with emphasis on Integrated Systems Research

N+2 Advanced Vehicle Concepts & Quick-Starts NRA Pre-Proposal Meeting
February 19, 2010

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Integrated Systems Research Program
Aeronautics Research Mission Directorate

NASA Aeronautics Portfolio in FY2010



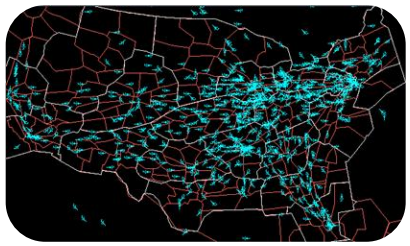
Fundamental Aeronautics Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to enable revolutionary changes for vehicles that fly in all speed regimes.

Integrated Systems Research Program

Conduct research at an integrated system-level on promising concepts and technologies and explore/assess/demonstrate the benefits in a relevant environment





Airspace Systems Program

Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.


Aviation Safety Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to improve the intrinsic safety attributes of current and future aircraft.



Aeronautics Test Program

Preserve and promote the testing capabilities of one of the United States' largest, most versatile and comprehensive set of flight and ground-based research facilities.

Why Green Aviation? – National Challenges

Fuel Efficiency

•In 2008, U.S. major commercial carriers burned 19.6B gallons of jet fuel. DoD burned 4.6B gallons

•At an average price of $3.00/gallon, fuel cost was $73B

Emissions

•40 of the top 50 U.S. airports are in non-attainment areas that do not meet EPA local air quality standards for particulate matter and ozone

•The fuel consumed by U.S. commercial carriers and DoD releases more than 250 million tons of CO_2 into the atmosphere each year

Noise

•Aircraft noise continues to be regarded as the most significant hindrance to NAS capacity growth.

•FAA's attempt to reconfigure New York airspace resulted in 14 lawsuits.

•Since 1980 FAA has invested over $5B in airport noise reduction programs

Significant Reduction in Environmental Impact of Aviation is Possible

Operations
Estimated Fuel Savings

Continuous climbs and descents (data from top-27 airports):

- **188M gal/year reduction in fuel burn with direct climbs**
- **218M gal/year reduction in fuel burn with continuous descents**

Direct routing/improved re-routing/collaborative Traffic Flow Mgmt

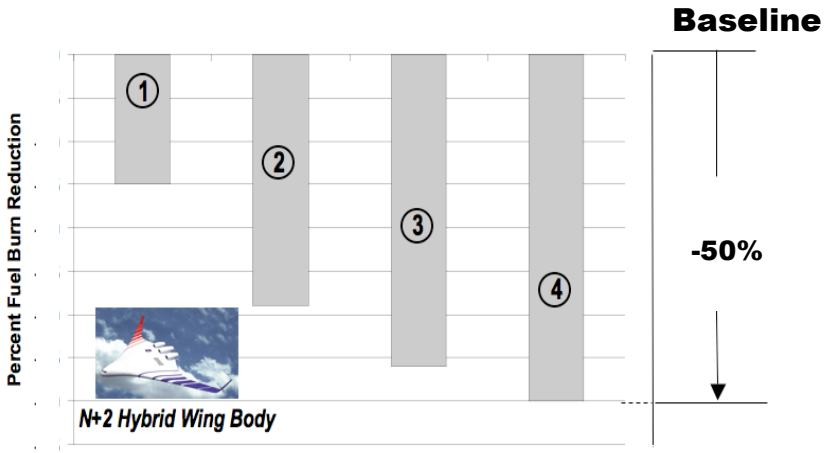
- **200M gal/year fuel savings**

"No-stop" taxi operations (data on arrivals only at 35 OEP airports):

- **15M gal/year reduction in fuel burn**
- **1M kg/year reduction in harmful emissions (CO, HC, NOx, SOx)**

Vehicle
Estimated Fuel Savings*

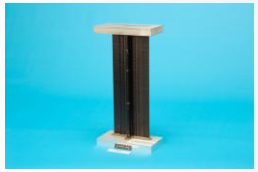
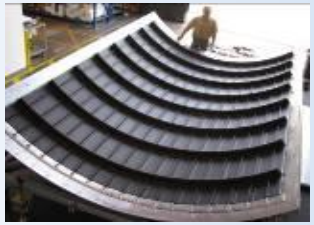
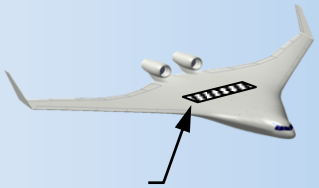
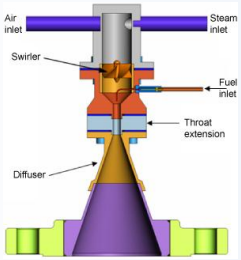
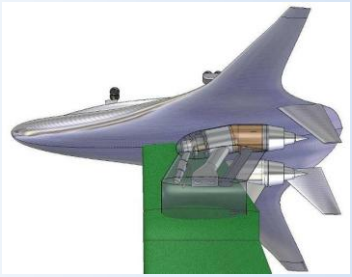
Achieving Significantly Reduced Fuel Burn Will Require Integration of Multiple Technologies



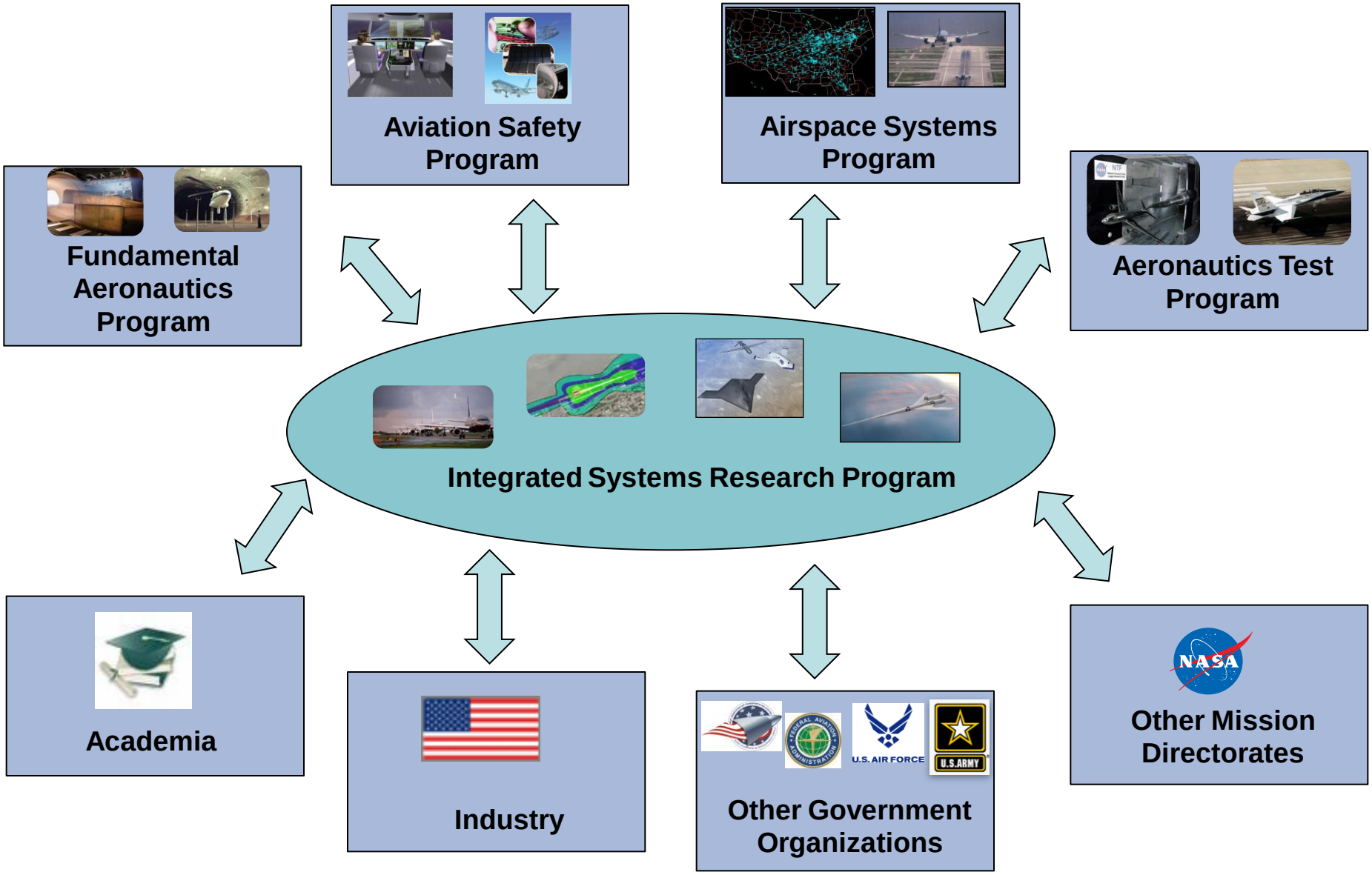
1 = Hybrid wing configuration
2 = + advanced engine and airframe technologies
3 = + embedded engines with BLI inlets
4 = + laminar flow

*** NASA systems analysis results. Reductions relative to B777 with GE90 engines.**

Integrated Systems Research Program (ISRP)-
Environmentally Responsible Aviation (ERA) Project

	Fundamental Aeronautics		Integrated Systems Research	
	Components	**Sub System**	**System**	**Testbed A/C**
Airframe Lightweight Structures Flight Dynamics and Control Drag Reduction Noise Reduction				**Demonstrated fuel burn savings:** Over 50% reduction 
Propulsion Combustor Technology Propulsor Technology Core Technology				 **Emissions reduction:** Local air quality: 75% less NO_x Global climate: 50% less CO_2
Integration Systems Analysis Propulsion Airframe Integration Propulsion Airframe Aeroacoustics Advanced Vehicle Concepts				 **Noise reduction:** -42 dB off of Stage 4

Collaboration and Partnerships



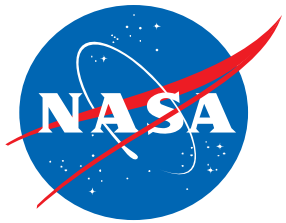
Current Status and Future Plans for ISRP and the ERA Project

- Began Program and Project Implementation on October 1, 2009, however, initial efforts were limited due to a Continuing Resolution until December 18, 2009

- Plan to interact with Industry and Other Government Agencies to strengthen existing partnerships inherited from SFW Project and form new partnerships for ERA

- Continued Roll-out of detailed technical plans at future aerospace meetings and conferences

- Annual Technical Meeting and Presentation of Accomplishments in November 2010


NASA